LANDFIRE Biophysical Setting Model

Biophysical Setting 3311320 Central Mixedgrass Prairie

☑ *This BPS is lumped with: 1148; 1150*

☐ *This BPS is split into multiple models:* *If BpS 1148 and 1150 map out in MZ's 27 or 33, lump with 1132. We are lumping BpS 1148 because 1148 sand prairie is really intended for Nebraska Sandhills (Keith Schulz, NatureServe, pers comm). It is peripheral to and only a component of 1132 in MZs 27 and 33.*

We are also lumping BpS 1150 Tallgrass Prairie into 1132 Mixedgrass Prairie. The tallgrass prairie system does not occur here but rather further east due to precipitation patterns. Only tallgrass species might occur in MZ33. Therefore, just consider those species as part of the mixedgrass system.

General Information

Contributors (also see the Comments field) **Date** 10/12/2006

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Vegetation Type
Upland Grassland/Herbaceous

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Dominant Species
PASM
SCSC
HECO26
BOGR2
BOCU
SONU2
PAVI2

Map Zone
33

Model Zone
☐ Alaska
☐ California
☐
☐ Great Basin
☐ Great Lakes
☐ Hawaii
☐ Northeast
☑ Northern Plains
☐ N-Cent.Rockies
☐
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

This type historically occurs in western KS, western NE, eastern CO and northeastern NM. This becomes more common proceeding east. This BpS comprises the majority of acres in MZ33. It occurs in every ECOMAP subsection of MZ33 and CO portion of MZ27. See map of Central Shortgrass Ecoregional Plan (The Nature Conservancy 1998) for mixedgrass and shortgrass prairie potential. In NM, this type would be most prevalent along the eastern boundary of the mapzone.

Biophysical Site Description

This type occurs on sandy loam, loamey or clayey upland sites of the southern Great Plains.

In NM and CO, elevations range from 1500-2000m. In KS, elevations can be 1000m.

Precipitation ranges from 14-22in, and occurs predominantly during the summer. Precipitation can go

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down to 10in.

Midgrasses and not shortgrasses would be on steeper slopes and rockier sites - but these are isolated occurrences. Away from the eastern edge of the mapzone, this is the most common situation for this type in NM, i.e.: on rocky breaks and mesa slopes.

Vegetation Description

Historically, vegetation was co-dominated with tallgrass, midgrass, short grass, and shrubs. (Species in order of dominance in boxes.) Dominant species include mix of tall and short grass - side oats grama, needlegrasses, little bluestem, yellow indiangrass, big bluestem, switchgrass, blue grama and western wheatgrass (most dominant in CO and KS), with intermingled forbs - American vetch.

On sandy loam sites - graminoid species, such as Andropogon hallii, Sporobolus cryptandrus (in current more degraded sites, but not as much in historical), Calamovilfa longifolia, Hesperostipa comata and Bouteloua gracilis and Bouteloua hirsuta can also be found within this system. Shrub species include 5-7% Western sandcherry, Prunus pumila L. var. besseyi (not in NM). Yucca glauca is present. Also present - switchgrass, little bluestem, yellow indian grass and more rarely - western wheatgrass. Farther east, might get leadplant. Sand bluestem occurs on sandy range sites in eastern portion whereas big bluestem occupies sandy foothills sites (However, a reviewer felt that ANGE big bluestem should rather be part of 1147 WGP Foothills and Piedmont Grassland; therefore, ANGE was removed from the dominant species list).

Shrubs included four-wing saltbush, winterfat, with lesser amounts of rabbitbrush, broom snakeweed, fringed sage, sunsedge and also plains prickly pear.

Disturbance Description

Historically, fire return intervals were probably approximately 20-25yrs (Dan Nosal, Rich Sterry, Terri Schulz, pers comm) - slightly shorter return interval (more frequent fire) and probably less variable than shortgrass prairie due to higher fuel loads, at least in eastern Colorado/western Kansas area. However, shortgrass prairie interval was changed to approx 20-25yrs post-review; therefore, since it is thought that mixedgrass interval should be shorter than shortgrass, but because original mixedgrass model had a 20-25yr interval, RL changed the MFRI for mixedgrass to approximately 15-20yrs. Also - RA model for R4PRMGs Mixedgrass Prairie south, was modeled with an interval of nine years. And MZ34 1132 Mixedgrass Prairie was modeled with an interval of 11yrs. All modelers/reviewers informed of changes.

We are uncertain about MFRI in general for the prairie ecosystems. We have few consistent records on fires and their extent and frequency, particularly in good condition sites. However, fires on the landscape level occur frequently and generally burn in a mosaic pattern. They do not return to the same acreage that frequently, however.

Going east out of MZs 27 and 33, MFRI gets shorter. Return interval for fire could be extended by ungulate grazing. Fire return intervals are now occurring more infrequently - over 50yrs (based on years of personal observation, Sprock et al).

Prairie dogs would have occurred extensively. There were some very large towns, but there were also areas without any towns. When present, they would likely extend the MFRI.

Episodic disturbance caused by insect infestation (grasshoppers, range caterpillars and Mormon crickets).

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Large herds of bison went through this system - as well as elk, deer, pronghorn. The dynamics of the herbivore populations is key to the MFRI, because it creates a mosaic pattern of heavier and lighter grazed areas.

However, currently, there is overgrazing/overstocking and continuous grazing, creating more shortgrass and increasing fire intervals (less fire).

This is a drought tolerant system. However, extended drought (over 3-4yrs) will reduce cover.

Drought and grazing were probably most important disturbances historically.

Adjacency or Identification Concerns

This system could be confused with shortgrass prairie. Production is less in shortgrass versus mixedgrass prairie. Grasses taller in mixedgrass prairie. These two systems are intermixed, with the shorter grasses further west with less precipitation (other than the foothills areas).

Mixedgrass and shortgrass can be distinguished by a higher occurrence of blue grama, which would indicate shortgrass. If there is more mixedgrasses (i.e.: 50% or more midgrasses), the system should be considered mixedgrass prairie.

Much of the historic mixedgrass in Colorado has been converted to row crops/cropland/agriculture, transportation corridors and some shortgrass prairie as a result of continuous grazing. Agricultural conversion is the primary threat to this system today, in NM as well. These were sites for extensive dryland cropping. Abandoned fields are now in a different process of old field succession with some of the same species.

Some mixed grass prairie has been converted to shortgrass prairie through continuous livestock grazing. Central Mixedgrass Prairie has also been greatly reduced currently due to agricultural conversion. In Colorado in some areas, there was historically lower producing mixedgrass, but now it's shortgrass.

While we do not currently have much little bluestem in CO, there have been significant stands in the past.

Currently, there are some non-natives - cheatgrass, kochia, but not a big invasives problem.

Currently, regardless of whether loamy, clayey or sandy loam soil, long-term continuous grazing changes plant composition to primarily sod-bound shortgrasses such as blue grama. However, this was questioned upon review for MZ27, especially on sandy soils, and where the conversion might be to Sporobolis cryptandrus (and Aristida purpurea longiseta with longer periods of continuous grazing).

Native Uncharacteristic Conditions

When mixedgrass appears like shortgrass with shortgrass species, it is uncharacteristic.

Scale Description

This is a matrix community in areas to the east. In CO and western KS - the Central Shortgrass Prairie Ecoregion - it is considered a large patch system. Mixedgrass prairie can occur in small to large patches. Disturbances are also variable in size - small to large, huge patches. Driving variable is climate (drought, low rainfall, etc), grazing, and to a lesser extent fire.

Issues/Problems

**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

The successional class model used for this system was adopted from a draft version of a shortgrass system.

Comments

This model for MZs 27 and 33 was adapted from the draft model for BpS 1149 shortgrass prairie for MZs 27 and 33 created by Terri Schulz, Harvey Sprock, Rich Sterry, Dan Nosal and Keith Schulz, who were also the modelers for 1132. Other modelers for MZs 27 and 33 for 1132 were Keith Schulz, Randy Reichert. Other reviewer for MZs 27 and 33 was Harvey Sprock.

Model for MZs 27 and 33 for BpS 1149 was adapted from the model from the same BpS from MZ28 created by Galen Green, Wayne Robbie, Anne Bradley and reviewed by Vic Ecklund and Chuck Kostecka. Model changed significantly due to different climate, environment and evolutionary history with grazing.

The model for MZ28 was based on the Rapid Assessment model R3PGRS, which was reviewed by B Baker (bakerwl@wyo.edu). Minor edits made on 5/6/2005 by Mike Babler, mbabler@tnc.org, changed some species and class B 15 to 20%, class C 75-65%, class D 5 to 10% to better match VDDT model output.

The Rapid Assessment model was originally based on the FRCC model PGRA6. Review suggest combining all plains grasslands. Because of species composition differences, and class differences, 1147 and 1149 were not combined.

Vegetation Classes

Class A **7 %**

Early Development 1 Open

Upper Layer Lifeform

- ☑ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

1

Indicator Species and Canopy Position

ARIST Upper
VUOC Lower
AMBRO Upper
SPCR Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	30 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class A is early succession stage. Species include - sand and tall dropseed, sixweeks fescue, Red three-awn, ragweed and annual forbs. (Currently, you would see non-native annuals in this class such as cheatgrass and kochia; might also see non-native of bindweed on prairie dog towns today, but not historically.) There was also a lot of bare ground in this stage. This would also be a typical prairie dog town and buffalo wallows. (Today, might be go-back-cropland.)

Native grazing occurs - bison, on approximately five percent of this class each year, but does not cause a transition.

Fire might occur, but not often - every 100yrs+. Would be small occurrence due to low fuels. It doesn't set back succession to zero, in terms of modeling. Fire would be more frequent in mixedgrass vs shortgrass due to higher fuel loads.

This class might move to the next stage more quickly due to higher precip levels. Modelers originally kept

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this age range at 20yrs, as that was the original interval as in the draft model for shortgrass for east CO/west KS MZs 27 and 33; because of the mapzones of interest and similar large patch systems, modelers wanted it to be similar. However, because the draft model subsequently changed post-review, RL therefore also changed the time spent in this class to 15yrs. All modelers informed and agreed.

Prairie dogs not as extensive in mixedgrass versus shortgrass in these MZs 27 and 33. Higher proportion of this area wouldn't be suitable - steeper slopes. Prairie dogs modeled as Option 1 and occurring on 10% of the class each year, maintaining this stage.

The composition in class A implies significantly different edaphic conditions from class B, not just fire succession. In fact it seems more of old-field conditions or long term prairie dog occupation possibly coupled with drought, and B. curtipendula would still be part of the mix regardless.

Class B **90 %**

Late Development 1 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

1

Indicator Species and Canopy Position

PASM
Upper
HECO26
Upper
SCSC
Upper
BOCU
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	31 %	80 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	None	

- [x] Upper layer lifeform differs from dominant lifeform.

Scattered shrubs may be present (up to 10%, maybe up to one meter) - four wing saltbush, winterfat (loamey and clayey sites), Western sandcherry and yucca (sandy sites).

Description

This is the historic climax plant community with a mix of short, mid and tall grasses. The mid and tall grasses are much more common in this type than in shortgrass prairie. Species include western wheatgrass, little bluestem, needle and thread, sideoats grama, and also in lesser amounts - blue grama, prairie sandreed (on sandy loam soils), green needle grass (loamey and clayey soils), buffalograss, galleta grass (southern area), fringed sage, fourwing saltbush, winterfat, switchgrass, sand bluestem (eastern part) and big bluestem (western/foothill part).

Because there's higher precip in mixed vs shortgrass, taller grasses and higher canopy cover.

Continuous grazing practices currently have turned this more into shortgrass and sod. Continuous, heavy grazing can also bring this class to C - which didn't happen often historically, so it was modeled with a 0.001 probability.

Native grazing occurs on 70% of the class each year but doesn't cause a transition.

Prairie dog impact occurs, but infrequently (.004 probability), taking this class back to class A.

Replacement fires occur more often in this class. It doesn't set succession back to 0, because grasses come back within the year or one to five or more years depending on climate following the fire. Fires modeled as occurring every 25yrs. Fires would occur more frequently in mixedgrass than shortgrass.

Drought occurs approximately every 40yrs but does not cause a transition.

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Currently, there probably isn't this much of class B - much less - due to conversion to ag/cropland. Many areas that haven't been converted to rowcrops have been changed to class C due to continuous grazing currently.

Class C 3 %

Late Development 2 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

1

Indicator Species and Canopy Position

BOGR2
Lower
BUDA
Lower
OPPO
Low-Mid
YUGL
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	81 %	100 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [x] Upper layer lifeform differs from dominant lifeform.

Scattered shrubs may be present - snakeweed, prickly pear cactus and yucca.

Description

This is the sod class that would have been a very small, localized condition historically. However, today, would be very prevalent. Historically, would have just had small areas of continuous grazing or migration corridors. This would consist of buffalograss (not on sandy sites), blue grama sod. Forbs might include scarlet globemallow.

Currently, most of this system is in this class due to continuous livestock grazing practices. This occurs (Option 2) on 90% of this class each year.

Replacement fires occur infrequently in this class due to lower fuels - every 100yrs+, and they don't set succession back but rather maintain this stage, in terms of modeling.

Prairie dog impact occurs infrequently (0.004 probability) and would take this class back to A.

Drought occurs approximately every 20-40yrs and might cause a transition back to B.

Class D 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class		

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

Fire Regime Group:** **II**

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

☑ Literature
☑ Local Data
☑ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	15			0.06667	100
Mixed					
Surface					
All Fires	15			0.06669	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☐ Insects/Disease
☑ Native Grazing
☑ Other (optional 1) prairie dogs
☑ Wind/Weather/Stress
☐ Competition
☑ Other (optional 2) continual grazing

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